STUDIES ON SERUM LIPIDS IN ACNE VULGARIS

FREDERICK KALZ, M.D.*, ANTHONY JANAUSKAS, M.D., AND CLAUDE FOURNIER, M.D.

The role of the fat metabolism in the pathogenesis of acne vulgaris has been under discussion for many years. Most dermatological textbooks state that high fat intake tends to aggravate the condition and advise a diet low in fat for patients with acne vulgaris. Some of the oily foods, which are known to provoke pustular eruptions in many cases, such as chocolate and nuts, may exert an effect after ingestion of very small quantities. This is suggestive of a direct specific stimulation of the sebaceous glands rather than of an indirect effect mediated by an elevation of plasma lipids.

On the other hand, it is recognized that some patients with acne vulgaris may be quite susceptible to all foods containing fat and may note exacerbations after any fat meal. This suggests a general metabolic effect, Sutton (1) considered acne vulgaris a pustular lipoidosis on clinical grounds but admitted that there was little laboratory evidence for this hypothesis at present. Neumark (2) found elevated serum cholesterol in acne patients but this was not confirmed by Strickler and Adams (3), Levinn and Zugerman (4) and Rosen and Krosnow (5). Kile and collaborators (6) found the total amount of surface lipids increased in acne vulgaris but there was no difference in the proportions of the constituences of the lipids in acne patients and normals.

Juster and Thulliez (7) reported subnormal iodine numbers in the serum of acne patients and concluded that this may indicate a disturbed equilibrium between the unsaturated fatty acids and the other serum lipids. In view of these discrepancies, we thought it might be of interest to examine the plasma lipids of a larger number of acne patients and to study the influence of a fat meal on the lipid fractions. Normal persons and patients suffering from other cutaneous disorders were chosen as controls.

MATERIAL AND METHODS

1. Total lipids, total cholesterols, cholesterol esters, total fatty acids and lipid phosphorus were determined in 50 fasting acne patients. Ten normal persons were used as controls.

2. A fat meal consisting of a half-pint of 15 per cent cream, two eggs and 50 gms. of chocolate was given to 34 acne patients and the blood taken before and 4 hours after the meal, and the above mentioned tests performed. Seven normal young persons served as controls.

* From the Dept. of Medicine, subdepartment of Dermatology, McGill University, Montreal, Canada.

Received for publication May 24, 1951.

TABLE I

Serum lipids in 50 Acne patients and in 10 normal controls
(in mgm.%)

NO. OF PATIENTS	TOTAL CHOLESTEROLS	CHOLESTEROL ESTERS	FREE CHOLESTEROL	TOTAL LIPIDS	TOTAL FATTY ACIDS (AS PALMITIC ACID)	PHOSPHOLIPIDS (AS LECITHIN)
1	194	114	80	730	368	278.2
2	294	120	174	810	454	—
3	161	87	74	750	368	213.2
4	147	60	87	710	313	—
5	181	69	112	640	322	—
6	152	60	92	590	406	249.6
7	160	75	85	660	368	249.6
8	162	81	81	990	376	—
9	151	63	88	510	282	—
10	118	85	33	730	329	—
11	171	111	60	660	406	364.0
12	151	105	46	840	411	335.4
13	146	78	68	550	357	278.2
14	160	90	70	640	208	234.0
15	171	105	66	680	245	278.2
16	150	138	12	530	291	278.2
17	151	69	82	680	349	—
18	120	51	69	530	355	—
19	148	75	73	430	297	—
20	159	69	90	510	327	—
21	127	80	47	480	297	—
22	97	75	22	540	295	—
23	226	118	108	810	322	—
24	150	64	86	560	304	239.2
25	171	99	72	670	252	234.0
26	169	96	73	610	235	—
27	203	105	98	890	312	—
28	228	141	87	670	406	301.6
29	148	42	106	970	300	—
30	219	111	108	690	319	—
31	159	66	93	690	361	—
32	151	63	88	570	328	—
33	172	72	100	800	292	—
34	150	57	93	670	314	—
35	193	89	104	480	323	—
36	169	81	88	930	292	—
37	240	56	184	950	335	—
38	142	69	73	670	268	—
39	187	120	67	700	290	—
40	140	91	49	530	272	—
41	145	78	67	620	272	—
42	156	75	81	810	282	—
43	211	123	88	750	355	280.7
44	159	123	36	910	295	—
45	189	84	105	940	335	280.8
46	141	81	60	520	288	205.4
47	161	76	85	890	368	262.6
48	208	111	97	680	419	319.8
49	150	45	105	670	320	166.4
50	156	72	84	660	316	236.6
Average Values of 50 Acne pts.	167.28	85.36	81.92	690	323.98	264.3 (20 pts.)
Average Values of 10 Control Cases	162.5	93.7	68.8	616	375.8	313.5

3. Total cholesterols and cholesterol esters were determined in a total of 56 fasting acne patients, in 26 normal fasting controls, and 39 psoriasis patients; 10 patients with xanthelasma were included as additional controls.

The following methods were used:

(a) Total lipids: Bloor's method (8).

(b) Total fatty acids - Stoddard and Drury, modification by Man and Gildea (9). (The micro-equivalent values were changed to milligrams per cent and listed in the tables as 'palmitic acid').

(c) Lipid phosphorus: Joungburg, modification by Hawk, Oser and Summerson (10).

(d) Total cholesterols: Lieberman-Burchard reaction (11).

TABLE II

Plasma lipids in 34 Acne patients before and after fat meal

		AVERAGE VALUES	MINIMAL VALUES	MAXIMAL VALUES	NO. OF PATIENTS IN LOW, NORMAL AND HIGH RANGES		
					low	normal	high
		mgm. %	*mgm. %*	*mgm. %*			
Total Lipids (34 pts.)	a.c.	690.58	430	970	9	25	—
	p.c.	802.64	470	1270	4	26	4
Total Cholesterols (34 pts.)	a.c.	167.5	97	228	4	29	1
	p.c.	179	130	270	—	32	2
Cholesterol Esters (34 pts.)	a.c.	83.15	42	141	5	25	4
	p.c.	95	59	133	1	28	5
Free Cholesterol (34 pts.)	a.c.	84.35	22	184	4	29	1
	p.c.	83.97	36	150	3	29	2
Total Fatty Acids (as Palmitic Acid) (34 pts.)	a.c.	314.55	235	406	2	30	2
	p.c.	340.29	260	432	1	27	6
Phospholipids (as Lecithin) (10 pts.)	a.c.	252.72	168	319	—	9	1
	p.c.	282.88	236	322	—	7	3

(e) Cholesterol esters: Bloor Knudsen, modified by Levinson and McFate (12).

Table I presents the serum lipids of 50 fasting acne patients. There are great variations between the individual cases. The average figures are within normal limits with the exception of an abnormal distribution of the cholesterol fractions. The average values of the control cases are within normal limits. There were no significant differences between male and female patients and no correlation to the severity of the acne or the age of the patients seen.

Table II demonstrates the rise of plasma lipids after a fat meal in 34 acne patients. The average a.c. and p.c. values, the minimal and the maximal values, and the range of individual variations were normal. A small number of controls (7) not shown in this table showed comparable lipid distribution.

TABLE III

Comparison of cholesterol fractions in 50 Acne patients and 25 control cases

(Average values in mgm. %)

	TOTAL CHOLESTEROL	CHOLESTEROL ESTERS	FREE CHOLESTEROL
Acne patients (50)	167.28	85.36	81.92
Normal controls (25)	169.08	101.46	68.62

TABLE IV

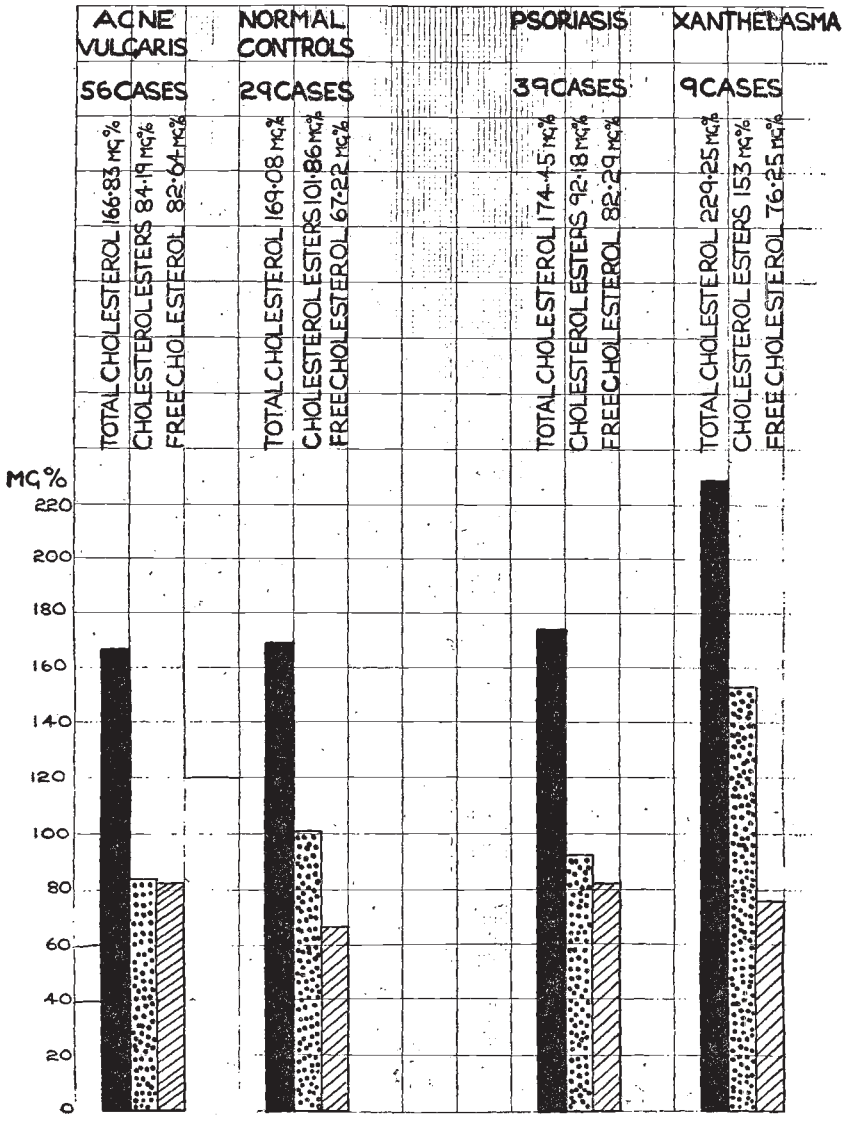

Table III demonstrates the relative low average cholesterol esters and high free cholesterols in the acne patients while the ratio of free and esterified cholesterols is normal in the control group.

These figures were subjected to a statistical analysis.

"The difference of cholesterol esters in acne patients and controls is 16.1 T: 2.76 at 73 degrees of freedom

The difference of free cholesterol in acne patients and controls is 13.1 T: 2.09 at 73 degrees of freedom

Such differences would be expected to occur by chance only with a probabilitv of about 1:100 and 1:25 respectively.

A real difference in the distribution of cholesterol fractions in acne patients and in controls is therefore highly probable, particularly as there is no difference in the total cholesterols between these two groups."[1]

Table IV compares the distribution of cholesterol fractions in a group of acne patients and in normal controls as well as in patients suffering from psoriasis and xanthelasma. The average figures of the cholesterol fractions showed a slight deviation from normal in the psoriasis group which may not be significant. In all patients with xanthoma, high total cholesterols and high cholesterol esters were found.

DISCUSSION

Hamilton (13) has shown that administration of testosterone produces acne vulgaris in normal persons. He pointed out that acne may occur after very small doses in some persons while very large doses were required in others to produce this effect. Cortisone and adrenocortico tropic hormone (A.C.T.H.) show a similar effect (22).

The question arises as to whether these substances exert their acneogenic effect by direct stimulation of the sebaceous glands or by an alteration of the fat metabolism. Hamilton (13) considered both possibilities and Rony and Zakon (14) and Reiss and Gellis (15) found that topical administration of testosterone caused stimulation and hypertrophy of the sebaceous glands and proved by their experiments a direct stimulation of these structures by the hormone. Some androgenic effect was also observed after Cortisone therapy (22).

The evidence for an alteration of the fat metabolism by administration of testosterone is contradictory. Bagdanovitch and Man (16) observed an increase of serum cholesterols after testosterone injections in guinea pigs, an observation which was not confirmed by others (17). Looney and Romanoff (21) examined the cholesterol fractions in 14 normal human subjects after injection of 350 mgms of testosterone and found a decrease of the esterified fraction; the total cholesterol values remained unchanged. Sposito (18), De Blasi (19) and Ludden (20) found no significant changes in the total cholesterols after testosterone administration.

Conn and others (23) stated that administration of A.C.T.H. was followed by a decrease in cholesterol esters in the serum of his patients while Cortisone did not produce these changes. Adlersberg (24) and Rich et al. (25) on the other

[1] Courtesy Professor H. Kalmus, Department of Genetics, McGill University, Montreal.

hand, found a significant increase in total cholesterols after both cortisone and A.C.T.H. in all their cases.

Hypercholesteremia is not known to produce follicular stimulation or acne vulgaris and none of our patients with xanthoma and hypercholesteremia showed any evidence of acne; it was noted that the free cholesterol values were relatively low in these patients.

Inasmuch as some observers reported the acne-producing hormones to cause changes in the cholesterol fractions in the plasma similar to those observed in our series of patients with acne vulgaris it is possible that a decrease in cholesterol esters and an increase in free cholesterols is of etiological significance in acne vulgaris.

SUMMARY

1. The serum lipids of 50 fasting acne patients were determined. The total lipids, fatty acids, total cholesterols and phospholipids were found to be normal.

2. The cholesterol esters were significantly lower and the free cholesterols higher in the acne patients than in control subjects.

3. These differences were found to be statistically significant.

4. The serum lipids of 34 acne patients were examined before and four hours after a fat meal. The increase of lipids after the meal was within normal limits.

5. The literature on the effect of testosterone and other hormones on the fat metabolism is reviewed.

6. It is suggested that the acne-producing hormones exert this effect not only by a direct stimulation of the sebaceous glands but probably also by their effect on the cholesterol metabolism.

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